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ABSTRACT

Thirty-two students from each of grades three and four were administered the Gates-MacGinitie Reading Tests, two word lists, and a number of tests selected from the Wisconsin Design for Reading Skill Development. Individual Performance Profiles were used to determine which Design tests to administer, the number of attempts required to attain skill mastery, and the total number of tests administered. The same number of students were selected from another school district and their Individual Performance Profiles were used to determine if implementation and testing strategies differed between Design schools. Results indicated significant positive relationships between mastering skills, general reading achievement, and functional word-attack ability. An adapted classification scheme identified no nonessential skills (not mastered by 75% of good readers), though no single skill related strongly to general reading achievement. Significant differences were found in the mean number of tests administered in the two schools, indicating different implementation and testing strategies. (Author/AA)

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Technical Report No. 421

THE RELATIONSHIP BETWEEN MASTERY OF SELECTED WORD ATTACK SKILLS AND READING PERFORMANCE

by

Elene S. Demos

Report from the Project on
Studies in Language and Communication Processes

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ABSTRACT

THE RELATIONSHIP BETWEEN MASTERY OF
SELECTED WORD ATTACK SKILLS AND READING PERFORMANCE

Elene S. Demos

Under the Supervision of Professor Wayne Otto

The major purposes of the study were to determine the relationship between mastery of a number of selected Wisconsin Design for Reading Skill Development (Design) word attack skills, general reading achievement, and functional word attack ability; and to investigate which of the selected skills were essential to, supportive of, or non-essential to general reading achievement. During the implementation of the study, several factors which warranted further examination were identified. Thus, the study's secondary purposes were to examine implementation and testing strategies of two schools using the Design and to examine the difference in the number of attempts to attain mastery of the selected skills and the subjects' performance in decoding synthetic words relative to the attempt they mastered the skill.

Sixty-four students, thirty-two from each of grades three and four, were administered the Gates-MacGinitie Reading Tests, two word lists, and the selected Design tests. Individual Performance Profiles were used to determine which Design tests to administer, number of attempts required to attain skill mastery, and total number of tests

administered.

The same number of students was selected from another school district (School B) and their Individual Performance Profiles were used to determine if implementation and testing strategies differed between Design schools.

Bivariate correlational analysis revealed there was a significant ($p < .0001$) positive relationship between mastering skills, general reading achievement, and functional word attack ability. An adapted classification scheme identified diphthongs as essential (mastered by 75% of good readers and less than 25% of poor readers); consonant blends, short vowels, consonant digraphs, base word endings as supportive (skills mastered by 90% of good readers and 50% or more of poor readers); and identified no non-essential skills (not mastered by 75% of good readers). Point biserial correlations then revealed that no single skill related strongly to general reading achievement. A t-test indicated significant differences in the mean number of tests administered in two schools using the Design, illustrating different implementation and testing strategies. Descriptive statistics indicated great differences in the number of attempts to attain mastery of the selected skills and little consistency between the attempt at which mastery of the selected skills was achieved and subjects' performance decoding synthetic words.

Wayne Otto, Professor
Curriculum and Instruction

CHAPTER I

INTRODUCTION AND PURPOSE

The teaching of reading in elementary schools has long been a subject of intense interest to the American public. For more than 100 years, important questions about reading (i.e., how to begin instruction, when to begin instruction, what materials to use, how to organize classes for instruction) have been debated by educators and laymen (Chall, 1967; Samuels, 1974; Mathews, 1966). The current debate is somewhat different, however, and focuses on the following question: Should reading be taught by fractioning it into small sequential units (subskill approach) or should reading be taught as a unitary act with an emphasis on meaning and comprehension (holistic approach)?

A number of programs have been developed during the late 1960's and early 1970's which focus on the subskill approach to reading. These programs were developed to help teachers individualize reading instruction with a logical, structured, sequential framework for presenting reading skills. Such programs, often called skills management systems, skills monitoring systems, objective-based systems, or criterion-referenced systems, are now extensively used in many classrooms. A commonality in existing skills management systems is the identification of skills which are considered essential for competence in reading by their authors. These objective-based reading

programs typically specify observable reading behaviors, so that the essential skills of the program can be measured.

The concept of essential skills has become so popular it permeates the current reading curricula, yet precisely which skills are essential to reading competence varies considerably from program to program. Additionally, the relationship of essential reading skills to reading achievement has yet to be conclusively documented. Because skills management systems have become so popular in school settings during the last decade and because little research exists on these programs, it is imperative that educators inquire into the contribution of these programs to reading ability.

Basic questions related to variables and processes within an individual skills management system were focused upon in the present study. The questions were investigated using The Wisconsin Design for Reading Skill Development (Design), a widely used skills management system. Because reading encompasses so many skills that a single study could not possibly examine the entire scope of reading skills, it was necessary to limit the investigation. Selected word attack skills were chosen because word attack is the first step toward building adequate reading ability, according to Roswell and Chall (1957) and others.

The study originally proposed to examine all forty-five Design word attack skills, but several factors developed during data collection which restricted the study to a selected number of word attack skills. While the study was limited in one area, it was broadened in

another area in order to examine the implementation and testing strategies of two schools using the Design. The study also incorporated an examination of the number of attempts to achieve mastery since there appeared to be great differences among the subjects.

Specifically, the purpose of this study was to answer three major questions:

A. What is the relationship between the number of selected Design word attack skills mastered and general reading achievement?

B. What is the relationship between the number of selected Design word attack skills mastered and functional word attack ability?

C. Which of the selected Design word attack skills are essential to, supportive of, and non-essential to general reading achievement?

The secondary purposes of this study were to examine the implementation and testing strategies of two school districts using the Design and to determine the difference in the number of attempts to attain mastery of the selected word attack skills and thus provide answers to the following questions:

D. Did the implementation and testing strategies of two school districts using the Design word attack element differ?

E. Did the number of attempts to attain mastery of the selected Design word attack skills differ between subjects and did the attempt at which subjects mastered the skills influence their performance on the Kurth Synthetic Word List?

Definition of Terms

Several terms are important to the understanding of this study and are presented in this section. They are defined as follows:

General Reading Achievement: the ability to recognize or analyze isolated words and the ability to read and understand whole sentences and paragraphs as measured by the Gates-MacGinitie Reading Test.

Functional Word Attack Ability: the ability to decode regular and irregular real words as well as synthetic words in isolation as measured by two Kurth word lists.

Essential Skills: those skills mastered by 75 percent of good readers and attained by less than 25 percent of poor readers [referred to by McNeil (1974) as skills associated with competency].

Non-Essential Skills: those skills which are not mastered by most (75 percent) of the good readers [referred to by McNeil (1974) as false prerequisites or unnecessary skills].

Supportive Skills: those skills mastered by nearly all good readers (90 percent) and attained by 50 percent or more of the poor readers [referred to by McNeil (1974) as skills that may be necessary but not sufficient].

Good Readers: those subjects who scored one standard deviation or more above the national norm on the Comprehension subtest of the Gates-MacGinitie Reading Test (1965).

Poor Readers: those subjects who scored one standard deviation or more below the national norm on the Comprehension subtest of the Gates-MacGinitie Reading Test (1965).

Individual Performance Profile: a computer generated report summarizing the progress of a student in word attack (see sample in the Appendix).

Review of Related Literature and Rationale for the Study

This discussion provides a rationale for the study, as well as a review of the related literature. The discussion begins with a brief explanation and review of skills management systems in reading and the rationale for evaluating specific aspects of them in this study. A description of the skills management system used in this study, The Wisconsin Design for Reading Skill Development (Design), is then presented along with previously conducted research related to general reading achievement and functional word attack ability which is pertinent to this study. An explanation for selecting word attack skills as the basis for investigation in this study is considered next, followed by a discussion of essential reading skills. The remainder of the chapter is devoted to educational innovation and change, a review of mastery learning, and a statement of the specific purpose for the study.

Subskills and Skills Management Systems

The widespread development and use of skills and objectives in reading has led to the creation of skills management systems in reading. Such systems, whether referred to as skills management systems or objective-based reading programs, are based on a subskill approach to reading. Proponents of a subskill approach suggest that learning to read involves the acquisition of a hierarchy of increasingly complex reading skills and that if reading is to occur at one level of the hierarchy, careful attention must be given to the lower level

prerequisite skills (Gagne, 1970). Staats (1968) suggests that learning subordinate units precedes final goal attainment and that learning to read is a complex task in which new skills are added to a basic repertoire of skills in a cumulative-hierarchical fashion.

Skills, sequences, and hierarchies are the foundation of a subskill approach to reading. This becomes evident as one examines skills management systems. Stallard (1976) reviewed fifteen major objective-based reading programs and found that the major characteristics of such programs were the following: identified skills which are essential for competence in reading, behavioral objectives for the reading skills, criterion-referenced tests which assess pupils' skill development, sources of materials keyed to specific skills, and a record-keeping system for student progress. These programs were designed to help teachers determine where students' strengths and weaknesses lie in the area of reading skills so that instruction can be geared to individual student needs (Smith and Johnson, 1976). "Developmental procedures were based on the assumption that reading is a systematic and measurable process and that mastery of essential subskills will contribute to successful reading performance" (Stallard, 1976, p. 3). More specifically, an underlying assumption of one skills management system is the " . . . notion of a part-whole relationship between specific reading skills and general reading achievement" (Fischbach, 1971, p. 2). This implies that instruction directed toward developing specific skills will increase general reading achievement. Thus, the subskill approach is the framework for skills management systems.

Johnson and Pearson (1975) describe similar characteristics of objective-based reading systems. Typically they share the following components:

1. A sequentially ordered list(s) of behavioral objectives for the various reading skills.
2. A number of tests, with one or more items to measure each objective.
3. Rules for deciding what level of achievement constitutes mastery of each objective; the mastery level usually falls somewhere between 75 and 100 percent.
4. Resource files which recommend specific workbook pages, books, or other instructional materials which can be used to provide instruction in the skills which have not been mastered.
5. A record-keeping system for reporting to parents, teachers, and others which children have and/or have not mastered which objectives.

Evaluation of such approaches is concerned with the attainment of specific reading skills and the accompanying ability to synthesize the skills and read isolated words, as well as connected text (Otto and Chester, 1975). Related to this, Johnson and Pearson (1975) claim that the real issue in using skills management systems is whether or not mastering a specific skill(s) improves a child's ability to read and/or comprehend running text. Undoubtedly, their concern over whether skill mastery improves a child's reading performance is an important issue which, if substantiated empirically, would lend support to skills management systems. If rejected on the basis of empirical evidence,

some educators would need to reexamine their definition and conception of the reading process.

In order to gather such evidence, it was necessary to identify subjects who were taught with a skills management system. The skills management system examined was the Wisconsin Design for Reading Skill Development (Design).

The Wisconsin Design for Reading Skill Development (Design)

The Design focuses on the reading skills considered essential for elementary school pupils. The major purposes of the Design are to identify and describe behaviorally the skills which appear to be essential to competence in reading, to assess individual pupil's skill development status, to manage instruction of children with different skill development needs, and to monitor each pupil's progress (Otto and Askov, 1973).

The comprehensive objective of the Design is to assist teachers with the implementation of individually guided education for reading skill development in the elementary school. Stated somewhat differently, Frieder (1970) believes that for effective teaching, educators must decide what they want children to learn, who already know it, how to teach it to those who do not, and how to decide when they have learned it. This position is one of the major explicit assumptions of the Design and is operationalized through the identification of essential skills, a statement of objectives, assessment techniques, the identification of appropriate teaching/learning activities, and evaluation procedures (Otto and Askov, 1973).

The Design includes six skill areas (word attack, comprehension, study skills, self-directed reading, interpretive reading, and creative reading) which have been clustered at various grade levels from kindergarten through grade six. The clusters are shown by area and grade equivalent in Table 1.

TABLE 1

SKILLS BY AREA AND BY TRADITIONAL GRADE LEVEL

Skill Area	Grade						
	K	1	2	3	4	5	6
Word Attack	A	B	C	D	-	-	-
Comprehension	A	B	C	D	E	F	G
Study Skills	A	B	C	D	E	F	G
Self-Directed Reading	A	B	C	D	←	E	→
Interpretive Reading	A	B	C	D	←	E	→
Creative Reading	A	B	C	D	←	E	→

(Otto and Askov, 1973, p. 15)

The six skill areas in Table 1 constitute a rather broadly based definition of reading. The narrow definition of reading as decoding is rejected by the Design because one cannot separate reading and thinking. "Divorce reading from thinking and all that is left is mindless word barking" (Otto and Askov, 1973, p. 16). However, since

decoding is critically important in reading, word attack is given first priority in the introduction and presentation of skills. In the area of word attack, the objective is to provide an organized approach to word attack skills. The assumption of the word attack component is that skill development is best facilitated when teachers attempt to direct learning experiences according to individual characteristics and needs of pupils.

General Reading Achievement

Proponents of the Design accept the notion of a part-whole relationship between specific reading skills and general reading proficiency and believe that general reading achievement can be increased by instruction directed toward the development of specific word attack skills. A system which suggests that the successful acquisition of reading ability is dependent on the acquisition of specific skills implies that there is a relationship between skill mastery and reading achievement. Likewise, teachers assume that mastering forty-five word attack skills helps children learn to read.

Research evidence to support this assumption is scarce. However, a study conducted by Fishbach (1971) suggests a correlation exists between mastery of Design word attack skills and reading comprehension. Fishbach (1971) examined the relationship between the number of Design word attack skills mastered and students' performance on standardized tests of global reading achievement in grades one through six. The Metropolitan Reading Tests were used in grade one and the Stanford Achievement Tests were used in grades two through six. The data for

each group were analyzed by multivariate analysis of variance to determine the regression of the standardized test scores on the mastery level. Data from the Metropolitan and the Stanford Tests were obtained from the regular fall testing program of a school using the Design. Each grade also received the appropriate level of Design word attack subtests. The total sample included 432 subjects.

Results of the test of the hypothesis of no relationship between mastery score level and general reading performance were rejected at every grade/unit level. A statistically significant positive relationship, .001 to .002, between word attack mastery level and reading performance was found at all grade levels.

The results of Fishbach's analysis generally provide support for an implicit assumption of the Design that general reading level is related to the number of specific reading skills mastered. Fishbach does caution that " . . . the results of this analysis could well be specific to the particular population used, to relationships existing at the beginning of the school year before most instruction had occurred, and to the particular reading achievement tests used" (1971, p. 4).

Examining the same question, Blohm (1975) compared 23 masters and 23 non-masters of word attack skills in one fourth-grade setting. Masters were defined as those students having acquired 40-45 word attack skills, and non-masters were defined as those students having acquired fewer than 40 word attack skills. The mean grade level score of the mastery group was significantly greater at .05 than the mean grade level score of the non-mastery group on the Metropolitan Reading

Test. Results of the Blohm study also suggest a correlation between mastery of Design word attack skills and reading comprehension.

Even though supporting evidence for an objective-based approach was provided by Fishbach (1971) and Blohm (1975), more research using different tests, a different sample, and selected word attack skills at various grade levels was done for this study to obtain additional information about the relationship between the number of Design word attack skills mastered and general reading achievement. General reading achievement was operationally defined here as the ability to recognize or analyze isolated words and the ability to read and understand whole sentences and paragraphs as measured by a standardized reading test.

Functional Word Attack Ability

Related to the implication that skill mastery increases general reading achievement was the implication that a focus on word attack skills results in functional word attack ability. Functional word attack ability was operationally defined as the ability to decode regular and irregular real words, as well as synthetic words in isolation. This assumption is inherent in the terminal objective of the word attack element of The Wisconsin Design for Reading Skill Development which states that " . . . students will be able to attack independently phonically and/or structurally regular words and will recognize all common irregular Dolch list words . . . " (Askov and Otto, 1972, p. 8).

Kurth (1975) examined subjects who had completed the word attack element to test attainment of the terminal objective. Subjects were asked to decode synthetic words designed to test individual phonic and

structural analysis subskills and real words consisting of regular and irregular words. The results of the synthetic word tests indicated that subjects had mastered the phonic and structural subskills tested in the study. A discrepancy between students' ability to decode phonically and structurally regular and irregular words was exhibited on the real word lists, however. Subjects performed better on the regular word lists than on the irregular word lists. Kurth's study focused on the outcome of instruction of subjects who had completed the Design word attack element and indicated that teaching word attack subskills had some value for decoding words, even though it did not provide rigorous support for the stated Design objectives.

Thus, the relationship between word attack skill mastery and functional word attack ability has been indicated, but not clearly established. This relationship needed to be investigated further, since this is the premise of most word attack components in skills management systems. The question then became, what was the relationship between the number of Design word attack skills mastered and functional word attack ability? Functional word attack ability was operationally defined here as the ability to decode regular and irregular words, as well as synthetic words in isolation.

Word Attack Skills

With the large number of skills management systems available in reading, it is imperative that research be conducted to identify essential, supportive, and non-essential skills for reading. An excellent starting point is in the area of word attack, since historically the

literature provides a strong theoretical base for the emphasis placed on word attack skill instruction. Elementary school teachers and reading specialists alike stress the importance of word attack skills and there is a general concensus that learning such skills is the basis for successful reading. Otto, McMenemy, and Smith (1973) place word attack at the beginning of the reading process. They believe that skill in word attack is basic to the development of skill in reading. Without the foundation of word attack, comprehension, fluency, and appreciation cannot be fully developed.

Concurring with this view, Roswell and Chall (1957) claim that the first step toward building adequate reading ability is the teaching of accurate word recognition skills. They state that "inaccuracy in word recognition is the major stumbling block among poor readers." If children can master minimal skills of sight vocabulary, picture and context clues, and word analysis skills, they will be able to attain a considerable degree of independence in word recognition. Brueckner and Bond (1955) also stress the essentiality of a reading program in building independence on the part of the reader. In order to gain independence, it is necessary for the learner to develop a flexible and diversified set of word-recognition techniques. The reader must be able to recognize words rapidly and with a minimum amount of effort if he is to attend to meaning.

Emphasis upon the contribution of word attack skills to reading ability also comes from several other authors, including Durr (1967) who states that "Proponents of all recognized procedures for teaching

reading now recognize that some method of word attack is essential" (p. 99). He further claims that the vital element in successful reading, "if any can be so classified," is the ability to translate from print to sound or thought and have meaning connected with it. Heilman (1972) stresses that learning word analysis skills, including phonics skills, is absolutely necessary for learning to read, and Gray's (1960) skill model places word perception at the center of the reading process.

The importance of mastering letter-sound correspondences as a necessary step in learning to read is further supported by Gibson (1965) and Johnson (1970). Gibson (1965) suggests that decoding letters into sounds is an important phase in becoming a proficient reader and, even though it is possible to learn to read without letter-sound correspondences, the transfer to new words depends on the use of the letter-sound correspondences whatever the method of original training. Johnson (1970) likewise suggests that sooner or later the beginning reader must be taught or must discover the code.

Chall (1967) concluded, after an extensive review of the research, that the first step in learning to read is learning the printed code. She further discovered that an early stress on phonics produced better word recognition and made it easier for the child to read with understanding.

Harris and Smith (1972) believe that reading involves many skills other than word recognition, but that word recognition skills are thought of first and taught first because a system of teaching children

to recognize words is so central to learning to read. Facility in decoding and perception is the crucial starting point for comprehension and the entire reading process. Deboer and Dallman (1964) concur that effective reading involves instantaneous recognition of whole words. It is clear to them, however, that since it is impossible to recognize all words at sight, the child must master certain skills which will enable him to identify new words independently. These skills are termed word recognition skills.

The importance of word attack subskills is thus substantially supported in the literature. However, little empirical evidence is available to verify that acquiring a specific set of word attack skills relates to general reading achievement. In this context then, a basic research question arises which must be investigated. Namely, which word attack skills are essential, supportive, and non-essential to general reading achievement. The question was answered in this study using the Design list of word attack skills to test students' word attack ability and to examine competent and poor readers' word attack profiles by applying an adaptation of McNeil's (1974) classification scheme.

Essential Reading Skills

Another issue inherent in skills management systems is the concept of essential skills. Management systems are " . . . based on the assumption that reading is a systematic and measurable process and that mastery of essential subskills will contribute to successful reading

performance" (Stallard, 1976, p. 3). This viewpoint is admittedly speculative and attention needs to be focused on the limited review of the literature available on essential skills.

The National Institute of Education (NIE, 1975) summarized the concept of essential skills by stating that "Published lists of reading skills reflect the thinking and experience of many educators and researchers" (p. 7). The fact that educators disagree on the basic skills included in management systems remains a source of concern to teachers of reading and a source of difficulty in the selection and evaluation of such systems. Programs with too few skills may have omitted vital skills and programs with too many skills may be unnecessarily burdening teachers and students and may be doing little to increase a student's reading ability.

The selection of essential skills for inclusion into various objective-based systems was investigated by Stallard (1976). She noted that one or more of the following sources was used to identify essential reading skills: " . . . consensus of professorial and practitioner opinion, generation and/or evaluation of specific skills lists by researchers and practitioners and survey of skill taxonomies in widely used basal readers and in curriculum guides" (p. 4). Her review of 15 skills management systems further revealed the inconsistencies in the selection of skills included in skills management systems. She noted a range of 31 to 312 total objectives in programs operating from kindergarten through grade six.

Rude (1975) also reviewed the characteristics of skills manage-

ment systems. His investigation of six systems uncovered the same phenomena. The number of essential reading skills ranged from 32 to 367 and there was little consistency among the skills labeled essential.

Summarizing the issue, most skills management systems' scope and sequence of skills are based on historical and consensual agreement among reading practitioners, curriculum experts, reading specialists, and classroom teachers with little empirical documentation. Since no one system can possibly include all skills, there is a related assumption that each system includes all of the essential skills.

Quite obviously, the diversity in the number of skills can be directly related to the specificity and detail with which the objectives are written. Also, since skill lists reflect the thinking and experience of many educators, there is bound to be diversity in the kinds of skills selected for inclusion into skills management systems. This diversity nevertheless creates confusion for teachers responsible for selecting, implementing, and evaluating programs.

A major research area identified by the National Institute of Education Conference on Studies in Reading, Panel 10, was to " . . . determine if there are essential skills or processing skills related to reading, what they are, how to identify and validate them, how they are interrelated, and which are causally related to reading" (NIE, 1975). A logical starting point is to examine existing lists of "essential" skills, skills which form the framework in skills management systems.

The goal of this approach is to determine if the identified skills of various reading curricula are essential, supportive, or non-

essential to the performance of a terminal reading task, which might be competent reading itself. Many investigations need to be conducted since the specific skill list for each skills management system reflects the individual author's conceptual framework and his specific definition of the terminal behaviors. Such investigations on curricular materials might develop competing sets of essential, supportive, or non-essential skills, but once these skills are identified, an entry level to begin validating each skill would be available.

One approach to determining essential skills is to look at good readers and examine what skills they have acquired (Spache, 1976). An alternative approach is proposed by McNeil (1974). He believes that one must examine the skill profiles of both competent and incompetent readers. If both competent and incompetent readers attained certain skills, one could assume that those skills must be necessary, but not sufficient (supportive). If most competent readers and few incompetent readers acquired a particular skill, that skill could be classified as an essential skill. Those skills which were not attained by most competent readers could be considered as unnecessary skills or "false prerequisites," since competent readers could read successfully without them.

McNeil's (1974) classification scheme, for identifying reading skills, centers around false prerequisites (non-essential skills), essential skills, and possibly necessary but not sufficient skills (supportive skills). His requirements for each category are as follows:

1. False prerequisites. Those skills which were unattained by most (75% or more) competent readers.

2. Skills that may be necessary but not sufficient. Those skills displayed by nearly all competent readers (90%) and by 50% or more of the incompetent readers.

3. Skills associated with competency. Those skills achieved by most competent readers (75% or more) and few incompetent readers (less than 25%).

McNeil identified "competent readers" as those children who made no more than four errors (98% accuracy) on tests which included reading unfamiliar passages. Students who made 50% or more errors were considered "incompetent readers."

McNeil's study dealt with 15 word attack skills which are consensually agreed essential skills. His research indicated that selecting words with affixes, distinguishing the meaning of homographs, and selecting similar sounds of r-controlled vowels were unnecessary. Four additional skills -- matching rhyming words, matching beginning sound to written single letter, matching sounds of short vowels, and matching sounds of single consonant digraphs -- were identified as possibly necessary, but not sufficient since both competent and incompetent readers had mastered those skills. Determining the number of syllables, matching vowel sounds in CVCE letter combination, matching vowel sounds in words with two consecutive vowels, differentiating long from short vowels, identifying base words, matching sounds of diphthongs, and recognizing compound words were skills associated with competency (McNeil, 1974).

Since McNeil found only seven of fifteen skills essential, it is conceivable that skills management systems may include more unnecessary or supportive skills than essential skills. Those systems which contain numerous skills may in fact include skills which are irrelevant to reading and which do nothing to enhance a child's ability to read. A system similar to McNeil's classification scheme may be a viable method for examining other essential skills included in various skills management systems.

Innovation and Change

The research process for the study brought up certain considerations which were not initially addressed. Because of the flexibility inherent in the Design, implementation procedures are often inconsistent. Otto and Askov (1973) suggest that as local needs and expectations become apparent, components of the Design might need to be adapted, extended, or rejected.

The adaptation of Design components was substantiated in a study by White and Demos (1977) investigating implementation procedures of schools using the Design. This, coupled with an initial examination of the data collected for the present study, led the researcher to further examine the data looking more precisely at implementation and testing strategies.

Looking first at what the Design staff discovered and suggests and secondly at what the data for this study revealed will help illustrate the rationale for changes from the originally proposed study

and the need to further investigate implementation and testing strategies. For instance, Buchanan and Quilling (1971) suggest that by the end of grades 3 and 4, students with an average IQ should have been exposed to and mastered 100 percent of all word attack skills at Levels B and C. Based on these findings, Otto and Askov (1973) suggest levels for administering the Wisconsin Tests of Reading Skill Development: Word Attack. By midyear, average and fast students should be assessed at Level D in both grades 3 and 4 and slow students should be assessed with Level C tests at grade 3 and Level D tests at grade 4. After three to five years, a school's performance should generally match the developer's target or suggestions.

The Rationale and Guidelines (Otto and Askov, 1973) also suggests an initial testing strategy for all levels of the Wisconsin Tests of Reading Skill Development: Word Attack. The data indicated that this strategy was not implemented. To compensate for these problems with testing, a number of alternative strategies was deemed warranted.

First, an initial observation of the data indicated the impossibility of examining all forty-five word attack skills since the majority of students had not been tested on those skills. Thus, it was necessary to examine a limited number of Design skills common to all of the subjects.

Secondly, first and second graders were eliminated from the study because the amount of testing required, even with the limited number of Design word attack skills, amounted to administering 175 individual Design word attack tests in grade 1 and 102 tests in grade 2.

The administration of such an extensive battery of tests to first and second graders was considered a highly impractical, inappropriate strategy; thus, those subjects were excluded from the study.

In view of these findings, additional data collection seemed warranted to determine if other Design schools used similar implementation and testing strategies, the suggestions provided in the Rationale and Guidelines (Otto and Askov, 1973), or based implementation and testing strategies on local needs and expectations.

A more indepth look at the findings of Berman and McLaughlin (1976) and other researchers (Havelock, 1973; Kritek, 1976; Derthick, 1972; Miles, 1964) substantiates the investigation.

In an intensive study of four federally funded programs, E.S.E.A. Title III, E.S.E.A. Act VII, Vocational Education Act-Exemplary Programs, and the Right to Read, Berman and McLaughlin (1976) investigated the process of innovation and the factors affecting innovation. Their theoretical framework for examining innovation suggests that " . . . the bridge between a promising idea and its impact on students is implementation, but innovations are seldom implemented as planned" (p. 349). Innovations may prove disappointing because of the difficult and uncertain process of implementation in an educational system that resists change, and not because of inadequacies of the innovation.

"Moreover, implementation . . . may result in significant modification in the planned innovation" (Berman and McLaughlin, 1976, p. 349). It has even been suggested that innovative projects "mutate" during implementation, which simply means they change over time within sites.

Further, it has been noted that they display considerable variations from one setting to another. Havelock (1973) suggests that as one proceeds with the implementation of an innovation, one must remain flexible and allow for revisions, readaptations, and/or changes in implementation strategies. Even though one has carefully selected and adapted an innovation prior to implementation, one may find that more adaptations are necessary to meet local needs, demands, and goals. "Innovations which last are those which become a part of the way of life of the client system, embedded in its everyday behavior" (p. 134).

Kritek (1976) says that in the past the literature on innovation and change has focused on the diffusion and adoption of innovations; however, today more attention is being directed to the implementation process and the problems involved in putting innovations into practice. He claims that program developers must be prepared for the changing of goals over time. For example, the Model Cities Program in East St. Louis was hardly recognizable at a later point in time, since its early objectives had been adapted and adjusted to the interested participants (Judd and Mendelson, 1973). Derthick (1972) concurs and states that federal programs that work at the local level have made adjustments in their programs because of local interests and those programs which fail do so because they do not compromise with local interests. Therefore, program developers must be cognizant of this and develop programs which are based on a flexible approach and which in fact invite and encourage modifications and adaptations.

Thus, a school's implementation of an innovation such as the

Design does not assure an accurate forecast of its actual use. Related to the present study, this simply means that Design implementation in different settings undergoes unique alterations in different settings. Therefore, a different school district was selected and the word attack profiles of third- and fourth-grade students from one school were compared with the school district originally selected for the study to discover what differences existed in implementation and testing strategies between the two districts using the Design.

Mastery Learning

Along with the additional data collection in another school, additional probing of the data from the school district originally selected for the study seemed important for the following reason. Many students at various reading levels had mastered the selected skills and were functioning at different reading levels. However, a distinguishing characteristic between the students was not necessarily mastery versus non-mastery of a skill, but the number of attempts it took a child to reach the criterion level of 80 percent.

Peterson (1972) in an extensive review of the research on mastery learning, summarized the major tenets of the mastery learning strategy as:

1. The mastery-learning strategy suggests procedures within the context of ordinary group-based instruction whereby student learning can be managed to promote fullest development.

2. With a mastery-learning strategy 75 to 90 percent of the students achieve to the same high level as the top 25 percent in a typical

instructional approach.

3. All students can master what they are taught.

4. Student learning is more efficient under a mastery-learning approach.

5. Mastery-learning produces greater student interest in and attitude toward the subject matter than traditional approaches. (Peterson, 1972, p. 5)

Since the principles of mastery learning are inherent in skills management systems and since the initial data appeared to reveal a difference in the number of attempts to reach the mastery level of the Design, a decision was made to investigate a major mastery learning concept. Of primary interest was the time variable dealing with the number of specific attempts (trials) it took a child to reach the mastery level for the selected Design word attack skills.

Since the literature and research in mastery learning is voluminous and is primarily concentrated at the secondary school level and the college level, with little research at the elementary level and virtually no research done on skills management systems in reading, the writer decided to review only a limited number of the major studies relating to the time variable, attempts or trials, mentioned in the preceding paragraph. Even though the research has been concentrated at the higher educational levels and in such areas as psychology and mathematics, some studies may offer implications for the elementary level in the area of reading.

Glaser (1968) reports wide individual differences in the number of units reached and the number of units mastered to an 85 percent

criterion level in the mathematics curriculum of Individually Prescribed Instruction (IPI) which is designed to help individualize instruction in grades K through 6. The average time taken to master a unit was 12 days and the range was from 1 to 60 days.

Atkinson (1968) presented results of research done with Stanford's Computer Assisted Instruction (CAI). Each CAI lesson is composed of a number of "main line" problems which the student must master before he can proceed in the program. The number of main line problems completed over seven months was taken as an index of the rate of learning. The median student completed roughly 2500 problems while the slowest student completed roughly 1000 problems, and the fastest completed roughly 5000 problems. Thus, the variation in the rate required to learn under the system was 5 to 1. Students were able to learn and master each task although the variability between subjects was great.

A study by Sjoren (1967) examined the premise that the degree of learning is a function of the ratio of the time spent to time needed to learn. Two time conditions allowed the subject to proceed at or near his own rate, but a third condition gave the subject a fixed amount of time to learn. The results indicated a significant positive relationship between the ratio of time spent to the time needed and the achievement test measures and aptitude scores.

Wright (1967) investigated the relationship between subject matter mastery as measured by subtests of several of the Stanford Achievement Test batteries and time as measured by grade level. The results

indicated that a large percentage of students eventually attain mastery but some students reach mastery faster than others and the amount of time needed to reach mastery varies for different subject matter.

The literature reviewed on mastery learning raises many questions about the differences among groups of students which are related to time factors. The mastery literature related to systematic instruction, especially in reading at the elementary level, however, does not help answer these questions as Bloom (1976) indicated. He explored the possibility of collecting data on systematic instructional approaches, such as programmed instruction, computer assisted instruction, or systematic instruction in small groups, to investigate aspects of his mastery learning theory. He met with little success because the studies did not exist. He further stated, " . . . such programs will eventually yield considerable basic data which may be used to test the ideas in this theory and its practicable implementation under school conditions" (Bloom, 1976, p. 201).

Bloom's comment on the lack of basic research using a systematic instructional approach and the fact that the majority of research has been centered at the college level help provide a rationale for examining skills management systems in reading at the elementary level as they relate to basic ideas of mastery learning theory. Therefore, it seemed warranted to begin exploring a virtually untapped area.

The problem which surfaced in the previous discussion centered upon the time variable, attempts or trials, to attain mastery of the selected skills in the Design. Two related questions were then asked.

Did the number of attempts to attain mastery of the selected skills differ between subjects and did the attempt at which subjects mastered the Design word attack tests influence their performance on the Kurth Synthetic Word List?

Statement of the Problem

The writer has raised several questions in the Rationale and Review of the Literature which were focused upon in the study. The primary purpose, then, was to answer three major questions:

A. What is the relationship between the number of selected Design word attack skills mastered and general reading achievement?

B. What is the relationship between the number of selected Design word attack skills mastered and functional word attack ability?

C. Which of the selected Design word attack skills are essential to, supportive of, and non-essential to general reading achievement?

The secondary purposes of this study were to examine the implementation and testing strategies of two school districts using the Design and to explore the difference in the number of attempts to attain mastery of word attack skills and thus provide answers to the following questions:

D. Did the implementation and testing strategies of two school districts using the Design word attack element differ?

E. Did the number of attempts to attain mastery of the selected Design word attack skills differ

between subjects and did the attempt at which subjects mastered the skills influence their performance on the Kurth Synthetic Word List?

The research hypotheses formulated to answer Question A were:

1. There is a significant positive relationship between the number of selected Design word attack skills mastered and general reading achievement as measured by the vocabulary subtest of the Gates-MacGinitie reading test.

2. There is a significant positive relationship between the number of selected Design word attack skills mastered and general reading achievement as measured by the comprehension subtest of the Gates-MacGinitie reading test.

The research hypotheses formulated to answer Question B were:

3. There is a significant positive relationship between the number of selected Design word attack skills mastered and functional word attack ability as measured by one Kurth synthetic word list.

4. There is a significant positive relationship between the number of selected Design word attack skills mastered and functional word attack ability as measured by one Kurth real word list.

The research questions formulated to answer Question C, using an adaptation of the McNeil (1974) classification scheme, were:

5. Which of the selected Design word attack skills are essential to general reading achievement as measured by the comprehension subtest of the Gates-MacGinitie reading test?

6. Which of the selected Design word attack skills are non-essential to general reading achievement as measured by the comprehension subtest of the Gates-MacGinitie reading test?

7. Which of the selected word attack skills are supportive of general reading achievement as measured by the comprehension subtest of the Gates-MacGinitie reading test?

The research hypothesis formulated to answer Question D was:

8. There is a significant difference between the number of Design word attack tests administered in two school districts.

The questions formulated to answer Question E were:

9. What is the difference in the number of attempts to attain mastery of the selected Design skills?

10. Is the attempt at which subjects master the Design word attack tests reflected in their performance on the Kurth Synthetic Word List?

CHAPTER II

METHOD

In Chapter I hypotheses and research questions related to word attack skill mastery, functional word attack ability, general reading achievement, implementation and testing, and attempts to attain mastery were presented. In the following sections, the method by which these hypotheses were tested and analyzed is described.

Subjects

Thirty-two children from each of grades 3 and 4 were tested in the study. To apply the classification scheme for examining essential, supportive, and non-essential skills, described in Chapter I, the writer desired an equal population of good and poor readers.

The original criteria established for selection of subjects were that subjects would be designated good readers if they scored in the top three stanines of the most recent standardized reading achievement test administered, and designated poor readers if they scored in the bottom three stanines of the most recent standardized reading achievement test administered, and if teacher judgment confirmed the test results. Because standardized reading tests were not administered to all students in the school district, the criteria were altered. Sample selection based on test scores was replaced by the use of teacher

judgment to initially identify the good and poor readers.

Three major studies dealing with teacher judgment provide evidence that teacher forecasts and standardized reading test results are highly correlated. Kermonian (1962) compared teacher ratings of reading readiness with scores on the Metropolitan Readiness Test. A correlation of .73 was reported between teacher ratings and the test scores; Kermonian further discovered that the majority of errors made by teachers were in the direction of overrating students, not underrating students. Kermonian's results confirm the findings of Kottemeyer's (1947) study.

Henig (1949) used the Lee-Clark Reading Readiness Test and a five-level categorization of teachers' ratings (excellent, good, fair, poor, very good) and compared these to five levels (A through E) for first-grade reading achievement. He found that teacher ratings were as valid as readiness tests in predicting later reading achievement.

Therefore, utilizing teacher judgment was considered appropriate for initially identifying subjects for the study and teachers were asked to designate their students as good, average, or poor readers based on the following: (1) the level of the basal reader in which each child was currently reading; (2) the child's level of performance in the reader; and (3) the teacher's experience with other students of the same age level at this point in the school year (February).

After this was completed, the 16 good readers and the 16 poor readers from each grade level were randomly selected from the pool of teacher designated good and poor readers. Once all the data were

collected (see Procedure), discrepancies between the standardized reading test scores on the Gates-MacGinitie and teacher judgment were discovered and the population then included good, average, and poor readers. Rather than reducing the total population, the average readers were maintained to help answer all the questions, except for those dealing with essential, supportive, and non-essential skills.

Reading Ability

The final determination of reading level was based upon each child's standard score on the comprehension subtest of the Gates-MacGinitie Reading Tests. Operationally defined, good readers were those subjects who scored one standard deviation or more above the national norm, average readers were those subjects who scored between one standard deviation above and below the national norm, and poor readers were those subjects who scored one standard deviation or more below the national norm. The number of subjects, by grade and reading ability, is shown in Table 2 along with the means and standard deviations on the Gates-MacGinitie Comprehension subtest.

Age

As of February 15, 1977, the chronological ages of the subjects were in the following range for each grade level: (1) Grade 3: age 8 years 4 months to 9 years 6 months; (2) Grade 4: age 9 years 4 months to 11 years 1 month. The median age of the subjects was 9 years 4 months.

TABLE 2

SUBJECTS' GRADE, READING ABILITY, MEANS, AND STANDARD DEVIATIONS ON THE GATES-MacGINITIE COMPREHENSION SUBTEST (RAW SCORES)

Reading Ability	Gates-MacGinitie Comprehension Subtest		
	Number	Mean	Standard Deviation
Good			
Grade 3	6	43.33	2.58
Grade 4	5	45.00	2.13
Average			
Grade 3	18	29.44	9.19
Grade 4	20	29.65	6.50
Poor			
Grade 3	8	9.50	2.56
Grade 4	7	12.28	2.81

Background

The subjects were chosen from both of two elementary schools in a suburban community in Wisconsin. The total district enrollment numbers 1,376 students and is distributed as follows: 928 students in grades kindergarten through 8, and 488 students in grades 9 through 12. Specific to this study, the total population of grade 3 included 111 students and the total population of grade 4 included 95 students. The community is located two miles southeast of Madison and is a suburban

area with most of the residents working in Madison. About 45 percent of the school population are village dwellers, and 50 percent are rural, of which 48 percent are non-farm and 2 percent are farm. About 35 percent of the population work for local, state, and federal government agencies.

Since 1970, the elementary schools have been implementing Individually Guided Education (Klausmeier, Quilling, Sorenson, Way, and Glasrud, 1971) and The Wisconsin Design for Reading Skill Development (Otto and Askov, 1973) as the means for individualizing instruction in reading.

To facilitate the individualization of instruction in curricular areas, the selected schools are also involved in the Wisconsin System for Instructional Management (WIS-SIM). This model for computer managed instruction focuses on providing information to educational decision makers (Belt and Spuck, 1974). Five major processes are involved in WIS-SIM; however, only one, achievement profiling, is of concern in the study.

Achievement profiling produces a report that summarizes the progress of an individual student across all Design word attack, comprehension and study skills objectives. This report, the Individual Performance Profile (IPP) shows the placement of a student in the instructional program at the time of the report and is generated through a computer data base. A sample IPP with the complete description of each component is included in the Appendix.

Instrumentation

Three areas of reading ability were assessed in the study. First, measures of functional word attack ability, two of the ten Kurth word lists (1975), using both synthetic and real words, were administered. Second, a measure of general reading achievement, the Gates-MacGinitie Reading Tests (1965), vocabulary and comprehension subtests, were administered. Third, selected reading skills were measured using the Wisconsin Tests of Reading Skill Development: Word Attack (1972).

Two of the Kurth word lists (1975) were randomly selected because a measure of each subject's functional word attack ability was required. Since the means for the two synthetic lists were not significantly different and the means for the eight real word lists were not significantly different, the writer decided to select only one synthetic list and only one real list. The two word lists then include both synthetic and real words. This was an important factor because as Johnson (1973) points out:

> . . . word attack tests should use synthetic words. The rationale for this view is that unless synthetic words are used, teachers can never be sure whether they are measuring the specific word attack skill in question or are simply measuring words that may be in a child's sight vocabulary. (p. 23)

Discussing the synthetic word list first, since it was not feasible to test all of the word attack skills included in the Design, Kurth selected Levels B and C, phonic and structural analysis skills, since " . . . the majority of the basic word attack skills are

clustered at these levels" (1975, p. 20). In developing the word lists, the frequency of occurrence of the specific phonemes tested was also considered. The synthetic words tested decoding skills using words with long vowel sounds, short vowel sounds, consonant blends, consonant digraphs, vowel diphthongs, vowel plus 'r', and base words and endings. The list of synthetic words broken into skills is presented in Table 3.

TABLE 3

KURTH SYNTHETIC WORDS SHOWN BY SKILL

Long Vowel Sound/e/
spleed
drete
tefe
beel
Short Vowel Sound/a/
strat
zat
clab
jad
Consonant Blend/pl/
plome
plute
plig
plang
Consonant Digraph/sh/
grash
shate
thrish
shoker

TABLE 3 (Continued)

Vowel Diphthong/oi/
foiter
toip
moil
coise
Vowel plus 'r'
plor
korm
lorp
jork
Base Words and Ending/ing/
yalting
flanging
gretting
murling

The order of presentation to the subjects is presented in Table 4.

TABLE 4

ORDER OF PRESENTATION OF KURTH SYNTHETIC WORDS

spleed
strat
plome
grash
foiter
plor
yalting
drete
zat
plute
shate
toip
korm

TABLE 4 (Continued)

flanging
tefe
clab
plig
thrish
moil
lorp
gretting
beel
jad
plang
shoker
coise
jork
murling

The real word lists developed by Kurth measured the extent to which subjects could attack phonically and structurally regular and irregular words they would encounter in reading tasks. Using the rank order list of 50,406 words of the Kucera-Francis Computational Analysis of Present Day American English (1967), Kurth applied a stratified random sampling technique to select the test words. Dolch words which were found in the sample of regular words were also included but considered as a separate category since the Design teaches the Dolch list as sight words. The words selected are shown by frequency strata, regular and irregular, and Dolch words in Table 5.

The word lists as presented to the subjects are presented in Table 6.

General reading ability or achievement was measured by the

TABLE 5

KURTH REAL WORDS BROKEN INTO FREQUENCY STRATA BY REGULAR, IRREGULAR, AND DOLCH WORDS

Regular Stratum 1	Irregular Stratum 3
forms	route
near	photograph
trial	mechanized
number	modulation
personal	internationalist
army	polarities
Regular Stratum 2	Dolch
butter	saw
bringing	may
wiped	some
spite	you
apartment	away
rendered	him
Regular Stratum 3	
banking	
sterling	
impinge	
epithet	
hearsay	
gazes	
Irregular Stratum 1	
imagination	
areas	
efforts	
population	
information	
education	
Irregular Stratum 2	
opinions	
legislation	
typical	
numerous	
London	
automobiles	

TABLE 6

ORDER OF PRESENTATION OF KURTH REAL WORDS

butter
near
bringing
imagination
areas
route
efforts
banking
wiped
opinions
saw
legislation
may
some
spite
typical
numerous
information
gazes
photograph
mechanized
sterling
trial
away
number
personal
London
apartment
education
army
impinge
him
utomobiles
you
modulation
internationalist
epithet
hearsay
population
polarities
forms
rendered

Vocabulary and Comprehension subtests of the Gates-MacGinitie Reading Tests, Form 1 (1965). The test is a norm-referenced, standardized instrument. The vocabulary test samples the child's ability to recognize or analyze isolated words. The comprehension test measures the child's ability to read and understand whole sentences and paragraphs.

The appropriate tests for each grade level and their alternate form reliabilities are shown in Table 7.

TABLE 7

GATES-MacGINITIE TESTS AND ALTERNATE FORM RELIABILITIES

Test	Grade	Subtest	Alternate Form Reliability
Primary C	3	Vocabulary	.85
		Comprehension	.87
Primary D	4	Vocabulary	.85
		Comprehension	.83

Specific word attack skills were measured using the Wisconsin Tests of Reading Skill Development: Word Attack, Form Q (1972). The specific tests selected corresponded with the skills tested using the Kurth Synthetic Word List and are shown in Table 8. The Wisconsin Tests of Reading Skill Development: Word Attack are criterion-refer-

TABLE 8

CORRESPONDENCE BETWEEN SELECTED WISCONSIN TESTS OF READING SKILL DEVELOPMENT AND KURTH SYNTHETIC WORDS

Wisconsin Tests of Reading Skill Development		Kurth Synthetic Word List
Level-Skill:	Test Name	Test Name
B- 5:	Consonant Blends	Consonant Blend/pl/
B- 7:	Short Vowels	Short Vowel Sound/a/
B- 8:	Consonant Digraphs	Consonant Digraph/sh/
B-11:	Base Words & Endings	Base Words and Ending/ing/
C- 4:	Long Vowel Sounds	Long Vowel Sound/e/
C- 5:	Vowel + r, a+l, a+w	Vowel plus 'r'
C- 6:	Diphthongs	Vowel Diphthong/oi/

enced and measure phonic analysis skills, structural analysis skills, and vocabulary skills. After the Design skills were determined, behavioral objectives were formulated for each skill. Multiple choice tests were then constructed to measure the behaviors defined in the objectives. Separate subtests were constructed to measure each behavior and an 80 percent criterion level of mastery was suggested to indicate skill attainment.

A brief description of each test, the number of items, and the Hoyt reliability coefficients are presented in Table 9.

TABLE 9

DESCRIPTION OF SELECTED WISCONSIN TESTS OF READING SKILL DEVELOPMENT, NUMBER OF ITEMS FOR SELECTED TESTS, AND HOYT RELIABILITY COEFFICIENTS

Level and Skill	Test Name and Description	Number of Items	Hoyt Reliability Coefficient
B5	Consonant Blends. In response to dictated nonsense words the child selects the blend that he hears in each nonsense word. Blends tested are *bl, cl, fl, gl, pl, sl, br, cr, dr, fr, pr, and tr.*	20	.79
B7	Short Vowels. In response to dictated nonsense words the child selects the vowel that he hears in each nonsense word.	15	.81
B8	Consonant Digraphs. The child selects the digraph that he hears in dictated nonsense words. Digraphs tested are *ch, sh,* and *th.*	17	.86
B11	Base Words and Endings. From printed response choices the child selects the correctly underlined base, or root, part of the word.	12	.79
C4	Long Vowel Sounds. In response to dictated nonsense words the child not only identifies the vowel heard in each word, but also indicates whether the vowel sound is long or short.	30	.84
C5	Vowel + r, a + l, a + w. With response choices of *ar, er-ir-ur,* or *al* and *aw,* this test measures the child's ability to recognize the vowel plus letter-after-the-vowel heard in dictated nonsense words.	17	.72

TABLE 9 (Continued)

Level and Skill	Test Name and Description	Number of Items	Hoyt Reliability Coefficient
C6	Diphthongs. With response choices of *ew*, *oi-oy*, and *ou-ow*, this test measures the child's ability to recognize the diphthong heard in dictated nonsense words.	15	.81

(Otto, Miles, Kamm, and Stewart, 1972, pp. 3-4)

Procedure

One test examiner was hired and trained to help the writer administer and score all the tests. Students at each grade level were randomly assigned to one of the two test examiners for purposes of administering the Kurth word lists. Both of the Kurth word lists, synthetic and real words, were administered individually to each third-grade subject and were given in reverse order to half the subjects to eliminate possible test effects.

Since the Kurth word lists have not been widely used, the directions for administering the word lists are presented below:

> The test words were printed on small flash cards in lower case letters. Only the proper nouns included in the real word list were capitalized. When administering the synthetic word list the examiner told each Subject:

> On each of these cards is a word which is not a real word and which does not make sense. When I show you the card, I want you to tell me aloud what you think the word is. If you do not know the word, make the best guess that you can. Do you understand?

When administering the real word list the examiner told each Subject:

> On each of these cards is a word which I want you to read aloud to me. If you do not know the word make the best guess that you can. Do you understand?

The examiner gave two sample items for each list.

> After the Subject had ten seconds to respond to an item on the test, his answer was recorded as either correct or incorrect. Any incorrect response which was corrected within ten seconds was scored as correct. If the word on the real word list was multisyllabic, the accent had to be placed on the accented syllable in order to be considered correct. The raw score for each Subject was the number of words pronounced correctly on each list. The Subjects were not told whether their responses were correct or incorrect. (Kurth, 1975, p. 41)

After the word lists were administered, a computer specialist employed by the WIS-SIM Project (referred to previously as a computer model to facilitate individualized instruction) requested an Individual Performance Profile (IPP) in word attack on all subjects. The IPPs were carefully examined and those subjects not tested with all of the word attack tests listed in Table 4 were administered the necessary tests, either individually or in small groups. Subjects were then administered the appropriate Gates-MacGinitie Reading Test in two sittings. The first sitting included the vocabulary subtest and the second sitting

included the comprehension subtest. The same testing sequence and procedures were followed for grade 4 subjects.

To answer the question related to implementation and testing strategies, another district involved in the Wisconsin System for Instructional Management (WIS-SIM) was identified and the Individual Performance Profiles (IPP) for the Design word attack element were requested on all students in one school in grades 3 and 4. Thirty-two children from each of grades 3 and 4 were randomly selected from a pool of 80 students at grade 3 and 80 students at grade 4. The school is located in an urban area in Wisconsin and borders on a wealthy suburban community. Hereafter, the school will be referred to as School B, whereas the original school in the study will be referred to as School A.

The last two questions involved examining the difference in the number of attempts to attain mastery and if the attempt at which subjects attain mastery might be reflected in their reading performance. Thus data from School A was used to answer these questions. No additional data collection or unusual procedures were used. The analysis is explained in the next section.

Summarizing to this point, the two hypotheses relating to general reading achievement involved the use of the Gates-MacGinitie Reading Test, vocabulary subtest and comprehension subtest; the two hypotheses relating to functional word attack ability involved two of the Kurth word lists, one synthetic word list, and one real word list.

The three research questions related to essential, supportive, and non-essential skills were answered by examining good and poor readers' attainment of the selected Design word attack skills via the Design word attack tests. The designation of subjects as good and poor readers involved the subjects' placement on the comprehension subtest of the Gates-MacGinitie Reading Test. Implementation and testing strategies were examined by selecting an additional school district and examining subjects' IPPs in word attack.

Analysis

Bivariate correlation analysis was used to test the four stated hypotheses. The Pearson product-moment correlation coefficient (Pearson's r) using DSTAT2 (Academic Computing Center, University of Wisconsin-Madison, 1973) was selected to examine both the strength and the direction of the linear relationship between the independent variable, number of selected Design word attack skills mastered, and the following dependent variables:

1. General reading achievement as measured by the vocabulary subtest of the Gates-MacGinitie Reading Test;
2. General reading achievement as measured by the comprehension subtest of the Gates-MacGinitie Reading Test;
3. Functional word attack ability as measured by the Kurth Synthetic Word List; and
4. Functional word attack ability as measured by the Kurth Real Word Test.

To answer the research questions related to essential, supportive, and non-essential skills, the following adaptation of McNeil's (1974) classification scheme was used to define the three categories of skills. First, good readers were defined as those subjects whose standard scores on the comprehension subtest of the Gates-MacGinitie Reading Test were one or more standard deviation above the national norm. Second, poor readers were defined as those subjects whose standard scores on the comprehension subtest of the Gates-MacGinitie Reading Test were one or more standard deviation below the national norm. Third, the three categories of skills were defined as follows:

1. Essential skills -- those skills mastered by 75 percent of good readers and attained by less than 25 percent of poor readers.
2. Supportive skills -- those skills mastered by nearly all good readers (90 percent) and attained by 50 percent or more of the poor readers.
3. Non-essential skills -- those skills which are not mastered by most (75 percent) of the good readers.

Comparing the implementation and testing strategies involved tabulating the number of Design word attack tests administered and computing a t-test (Hays, 1973) of the mean differences in the number of word attack tests administered in the two districts (Schools A and B).

Descriptive statistics were computed using CROSSTAB2 (Academic Computing Center, University of Wisconsin-Madison, 1975) to examine the questions related to the difference in the number of attempts to attain

mastery and to explore if the attempt at which subjects master is reflected in their performance on the Kurth Synthetic Word List.

Summary

Sixty-four students, thirty-two at grade 3 and thirty-two at grade 4, chosen from two elementary schools in a Madison suburban community (School A), served as subjects in the study. These subjects were tested with: (1) two individual word lists, one comprised of synthetic words and one comprised of real words; (2) the Gates-MacGinitie Reading Tests; and (3) selected Wisconsin Tests of Reading Skill Development: Word Attack.

Bivariate correlational analysis was used to test the stated hypotheses, a classification scheme was adapted from McNeil (1974) to identify essential, supportive, and non-essential word attack skills, and Individual Performance Profiles were used to examine questions relating to the number of attempts to attain mastery of the selected Design skills.

The same number of students was selected from another school district (School B) and their Individual Performance Profiles were requested and compared to School A to determine if a difference existed in implementation and testing strategies of Design schools. School B only participated in this portion of the study.

CHAPTER III

RESULTS AND DISCUSSION

The purpose of this chapter is to present the results of data analysis and a discussion of the data. Each hypothesis or research question will be restated and the data will then be presented, followed by a discussion of the hypotheses and research questions.

Hypotheses 1 and 2

The first two hypotheses dealt with the relationship between the number of selected Design word attack skills mastered and general reading achievement.

1. There is a significant positive relationship between the number of selected Design word attack skills mastered and general reading achievement as measured by the vocabulary subtest of the Gates-MacGinitie reading test.

2. There is a significant positive relationship between the number of selected Design word attack skills mastered and general reading achievement as measured by the comprehension subtest of the Gates-MacGinitie reading test.

Results Related to Hypotheses 1 and 2: Tables 10A and 10B, page 53, present the correlation coefficients for grades 3 and 4, respectively. The results revealed that the correlations between the number of selected Design word attack skills mastered and vocabulary are .838 at grade 3 and .649 at grade 4 and are significant at the .0001 level.

TABLE 10A

CORRELATIONS BETWEEN DESIGN SKILLS, GATES VOCABULARY, GATES COMPREHENSION, KURTH SYNTHETIC WORDS, & KURTH REAL WORDS FOR GRADE 3 (N=32)

Variable	Design Skills	Gates Vocabulary	Gates Comprehension	Kurth Synthetic	Kurth Real
Number of Design Skills Mastered	1.00				
Gates Vocabulary	.838	1.00			
Gates Comprehension	.747	.873	1.00		
Kurth Synthetic	.887	.852	.797	1.00	
Kurth Real	.839	.882	.846	.916	1.00

All correlations are significant at $p<.0001$

TABLE 10B

CORRELATIONS BETWEEN DESIGN SKILLS, GATES VOCABULARY, GATES COMPREHENSION, KURTH SYNTHETIC WORDS, & KURTH REAL WORDS FOR GRADE 4 (N=32)

Variable	Design Skills	Gates Vocabulary	Gates Comprehension	Kurth Synthetic	Kurth Real
Number of Design Skills Mastered	1.00				
Gates Vocabulary	.649	1.00			
Gates Comprehension	.548	.854	1.00		
Kurth Synthetic	.624	.844	.822	1.00	
Kurth Real	.640	.870	.886	.908	1.00

All correlations are significant at $p<.0001$

The correlations between the number of selected Design word attack skills mastered and comprehension are .747 at grade 3 and .548 at grade 4. The results are significant at the .0001 level. Therefore, Hypotheses 1 and 2 are accepted for grades 3 and 4.

Discussion of Results Related to Hypotheses 1 and 2: The data indicate that the third-grade correlations are extremely high between the number of selected Design skills mastered and general reading achievement. The relationship is stronger in vocabulary than in comprehension, however. The results support the findings of Fishbach (1971) who concluded there was a significant positive relationship between skill mastery and reading achievement.

For fourth graders, the correlations are significant, but not extremely high. The results for the fourth graders conflict with Fishbach's research. He discovered the relationship was more strongly supported at the higher grade levels.

Further data anlysis as shown in Table 13, page 60, indicates that subjects who master six to seven Design word attack skills have higher mean scores on the Gates-MacGinitie vocabulary and comprehension subtests than subjects who master one to five Design skills. For example, the mean raw score on the vocabulary subtest for masters is 40.65 at grade 3 and 27.20 at grade 4; for non-masters, the mean score is 20.92 at grade 3 and 15 at grade 4. Similar differences exist between masters and non-masters on the comprehension subtest also. Fourth-grade masters may have lower mean scores because they were administered a higher level of the Gates-MacGinitie Test.

Thus, it appears that the acquisition of specific skills is

TABLE 11

RAW SCORE DESCRIPTIVE STATISTICS FOR DESIGN SKILLS, GATES VOCABULARY, GATES COMPREHENSION, KURTH SYNTHETIC WORDS, & KURTH REAL WORDS FOR GRADE 3 (N=32) & GRADE 4 (N=32)

Variable	Grade	Sum	Mean	Standard Deviation	Variance	Minimum	Maximum
Number of Design Skills Mastered	3	182	5.69	1.79	3.19	1	7
	4	211	6.59	.98	.96	2	7
Gates-MacGinitie Vocabulary Subtest	3	1064	33.25	11.34	128.65	15	51
	4	846	26.43	7.04	49.54	9	39
Gates-MacGinitie Comprehension Subtest	3	866	27.06	13.53	183.03	6	47
	4	904	28.25	11.50	132.13	8	47
Kurth Synthetic Word List	3	547	17.09	8.37	70.02	1	28
	4	632	19.75	6.53	42.65	6	28
Kurth Real Word List	3	787	24.59	10.36	107.28	9	41
	4	909	28.40	8.87	78.70	10	41

related to general reading achievement and the data provide support for the basic assumption of skills management systems that general reading achievement is related to the number of reading skills mastered.

Hypotheses 3 and 4

The relationship between the number of selected Design word attack skills mastered and functional word attack ability were dealt with in these two hypotheses.

3. There is a significant positive relationship between the number of selected Design word attack skills mastered and functional word attack ability as measured by one Kurth synthetic word list.

4. There is a significant positive relationship between the number of selected Design word attack skills mastered and functional word attack ability as measured by one Kurth real word list.

Results Related to Hypotheses 3 and 4: Tables 10A and 10B, page 53, present the data for grades 3 and 4, respectively. The results show that the correlations between the number of selected Design skills mastered and functional word attack ability using synthetic words are .887 at grade 3 and .624 at grade 4. The results are significant at the .0001 level. The correlations for the number of selected Design skills mastered and functional word attack ability using real words are .839 for grade 3 and .640 for grade 4. Both correlations are significant at the .0001 level. Therefore, Hypotheses 3 and 4 are accepted for grades 3 and 4.

Discussion of Results Related to Hypotheses 3 and 4: The data

indicate that the third-grade correlation is extremely high between the number of selected Design skills mastered and functional word attack ability as measured by the Kurth Synthetic Word List. Further data analysis as shown in Table 12, page 58, indicates that third-grade subjects who master individual Design skills have a higher mean score on the corresponding Kurth synthetic words. For example, masters of Design skill, short vowels, have a mean score of 82.14 percent on the Kurth synthetic words testing short vowel/a/, while non-masters have a mean score of 31.25 percent. In other words, students who master a skill can read more short vowel words correctly than non-masters. This consistently appears across all the word attack skills tested, as shown in Table 12.

For grade-four subjects, the correlations are significant but not high. As in grade 3, fourth-grade subjects who master individual Design word attack skills have a higher mean score on the corresponding Kurth synthetic words. For example, in Table 12, page 58, fourth-grade masters of Design skill, short vowels, have a mean score of 83.06 percent on the Kurth synthetic words testing short vowel/a/, while non-masters have a mean score of 50 percent. This consistently appears across all the synthetic words tested.

Examination of the total mean raw score on all the Kurth synthetic words in Table 11, page 55, shows a very slight difference in performance between third and fourth graders. The mean raw score is 17.09 for third graders and 19.75 for fourth graders. A t-test on the mean scores was not significant ($t = -1.42$, $df = 62$, $p < .05$). In other words, third and fourth graders' performance were comparable. Thus,

TABLE 12

NUMBER AND PERCENTAGE OF MASTERS AND NON-MASTERS ON DESIGN SKILLS AND MEAN PERCENTAGE AND STANDARD DEVIATION OF MASTERS AND NON-MASTERS FOR EACH CATEGORY OF KURTH SYNTHETIC WORDS FOR GRADES 3 AND 4

Design Word Attack Skills						Kurth Synthetic Words (By Category)				ALL SUBJECTS	
Skill	Grade	Masters		Non-Masters		Masters		Non-Masters			
		Number	%	Number	%	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Consonant Blends	3 4	31 32	96.87 100.00	1 0	3.13 0	62.10% 64.06%	31.54 32.96	0 -	- -	60.16% 64.06%	32.91 32.96
Short Vowels	3 4	28 31	87.50 96.87	4 1	12.50 3.13	82.14% 83.06%	24.40 21.78	31.25% 50.00%	23.94 -	75.78% 82.03%	29.43 22.21
Consonant Digraphs	3 4	27 31	84.38 96.87	5 1	15.63 3.13	66.66% 70.97%	31.01 26.69	15.00% 0	22.36 -	58.59% 68.75%	35.13 29.10
Base Words & Endings	3 4	30 31	93.76 96.87	2 1	6.24 3.13	55.00% 62.90%	37.94 31.54	0 25.00%	0 0	51.56% 61.72%	39.11 31.74
Long Vowels	3 4	24 32	75.00 100.00	8 0	25.00 0	72.92% 79.69%	26.50 23.28	40.63% -	35.20 -	64.84% 79.69%	31.66 23.28
Vowel + r, a + l, a + w	3 4	21 29	65.63 90.63	11 3	34.37 9.37	84.52% 89.66%	24.34 20.61	43.18% 41.67%	33.71 28.86	70.31% 85.16%	33.86 25.28
Diphthongs	3 4	21 25	65.63 78.13	11 7	34.37 21.87	61.90% 65.00%	35.90 33.07	15.90% 7.14%	25.67 12.20	46.09% 52.34%	39.20 38.29
ALL SKILLS	3 4									61.04% 70.53%	29.88 23.32

the data indicate that mastering selected Design word attack skills influences subjects' performance in decoding synthetic words, although the difference is negligible between third and fourth graders.

The data indicate that the third-grade correlation is extremely high between the number of selected Design word attack skills mastered and functional word attack ability as measured by the Kurth Real Word List. Further data analysis, as shown in Table 13, page 60, indicates that grade 3 subjects who are masters of six to seven Design word attack skills have a mean score of 74.52 percent on the Kurth Real Word List, while non-masters, those subjects who have mastered only one to five Design word attack skills, have a mean score of 31.94 percent on the Real Word List. The total mean score for all third graders was 58.56 percent. In other words, students mastering six to seven Design word attack skills can read more real words correctly than students mastering one to five Design word attack skills.

For grade 4 subjects, the correlation is significant but not high between the number of selected Design skills mastered and functional word attack ability as measured by the Kurth Real Word List. Further data analysis, as shown in Table 13, page 60, indicates that fourth-grade subjects who are masters of six to seven Design word attack skills have a mean score of 70 percent on the Kurth Real Word List. Non-masters, those subjects who are masters of one to five Design skills, have a mean score of 32.14 percent on the Kurth Real Word List. The total mean score for all fourth graders is 67.63 percent and the standard deviation is 21.12.

TABLE 13

MEANS AND STANDARD DEVIATIONS FOR GATES-MacGINITIE VOCABULARY SUBTEST, GATES-MacGINITIE COMPREHENSION SUBTEST, KURTH SYNTHETIC WORD LIST, AND KURTH REAL WORD LIST FOR MASTERS/NON-MASTERS IN GRADES 3 AND 4

VARIABLE	MASTERS (Subjects who have Mastered 6-7 Design Word Attack Skills)				NON-MASTERS (Subjects who have Mastered 1-5 Design Word Attack Skills)				TOTAL SUBJECTS			
	Grade	N	Mean	Standard Deviation	Grade	N	Mean	Standard Deviation	Grade	N	Mean	Standard Deviation
Gates-MacGinitie Vocabulary Subtest (Raw Score)	3	20	40.65	6.945	3	12	20.92	3.704	3	32	33.25	11.34
	4	30	27.20	6.392	4	2	15.00	8.485	4	32	26.43	7.03
Gates-MacGinitie Comprehension Subtest (Raw Score)	3	20	34.90	9.358	3	12	14.00	8.169	3	32	27.06	13.52
	4	30	29.27	11.110	4	2	13.00	4.243	4	32	28.25	11.49
Kurth Synthetic Word List	3	20	80.18%	14.630%	3	12	29.17%	19.310%	3	32	61.04%	29.88%
	4	30	72.74%	21.990%	4	2	37.50%	22.730%	4	32	70.53%	23.32%
Kurth Real Word List	3	20	74.52%	15.374%	3	12	31.94%	8.338%	3	32	58.56%	24.66%
	4	30	70.00%	19.480%	4	2	32.14%	11.785%	4	32	67.63%	21.12%

Thus, the data indicate that mastering selected Design word attack skills influences all subjects' performance in decoding real words, but to a lesser degree at grade 4. Once again, Table 13, page 60, reveals smaller differences in the mean raw score on the Kurth Real Word List between third and fourth graders than between masters and non-masters.

A plausible explanation is that fourth graders have passed through the decoding stage and are no longer attending at the phoneme-grapheme level. Instead, they have moved into the contextual level, are using more semantic and syntactic clues, and are not focusing upon isolated nonsense and real words because they are more fluent readers.

In spite of the limited range in performance between third and fourth graders, the acquisition of reading skills is related to functional word attack ability, though to a lesser degree at grade 4 than at grade 3.

Questions 5, 6, and 7

These three questions deal with essential, supportive, and non-essential skills.

5. Which of the selected Design word attack skills are essential to general reading achievement as measured by the comprehension subtest of the Gates-MacGinitie reading test?

6. Which of the selected Design word attack skills are non-essential to general reading achievement as measured by the comprehension subtest of the Gates-MacGinitie reading test?

7. Which of the selected Design word attack skills are supportive of general reading achievement as measured by the comprehension subtest of the Gates-MacGinitie reading test?

Results Related to Questions 5, 6, and 7: Table 14, page 63, presents the number of good and poor readers mastering each selected Design word attack skill and the classification of each skill using an adaptation of McNeil's (1974) classification scheme. The results reveal that diphthongs are an essential skill, there are no non-essential skills, and the supportive skills are consonant blends, short vowels, consonant digraphs, base words and endings, and long vowel sounds. Using the stated criteria, the Design word attack skill, Vowel + r, a + l, a + w could not be classified.

Discussion of Results Related to Questions 5, 6, and 7: Of the seven Design word attack skills examined, five were found to be supportive, one was essential, there were no non-essential skills, and one skill could not be classified. Many of the skills tested by McNeil (1974) were also tested in this study, although different measures were used to assess the skills.

This study revealed that short vowels and consonant digraphs were classified as supportive skills which supports McNeil's (1974) results, even though he referred to them as possibly necessary but not sufficient. Base words and endings and long vowel sounds were classified as supportive skills which is contrary to McNeil's classification as essential skills. Diphthongs was the only skill which was classified essential and fell into the same category for McNeil.

TABLE 14

NUMBER AND PERCENT OF GOOD AND POOR READERS MASTERING THE SELECTED DESIGN WORD ATTACK SKILL TESTS AND DESIGNATION OF THE SKILLS AS ESSENTIAL, SUPPORTIVE, OR NON-ESSENTIAL BASED ON AN ADAPTATION OF McNEIL'S (1974) CLASSIFICATION SCHEME

Test Name	Classification	Good Readers (N=11)		Poor Readers (N=15)	
		#	%	#	%
Consonant Blends	Supportive	11	100%	14	93%
Short Vowels	Supportive	11	100%	11	73%
Consonant Digraphs	Supportive	11	100%	9	60%
Base Words & Endings	Supportive	11	100%	12	80%
Long Vowel Sounds	Supportive	11	100%	11	73%
Vowel + r, a+l, a+w	--	11	100%	6	40%
Diphthongs	Essential	11	100%	3	20%

The classification of diphthongs as the only "essential" skill in both McNeil's study and in the present study is difficult to explain. It could be that those students who can master a sophisticated skill such as diphthongs, or an esoteric skill such as the schwa, are those students who can master most of the word attack skills, comprehension skills, and study skills and would be considered "good readers" anyway.

Using the classification scheme, vowel + r, a + l a + w did

not fall into any of the cate[illegible]. This occurred because, for poor readers, the scheme deals wit[illegible] mastery levels of less than 25 percent and more than 40 percent. Thus the range from 26 percent to 39 percent is not accounted for in the classification scheme.

The results of the classification scheme were undoubtedly influenced by the fact that most good and poor readers had mastered all or most of the selected skills. This was an unanticipated result and without much skill variability, the findings for these questions should not be generalized beyond the population tested. Further research may produce the same results which would then lend more support to these findings, but until that occurs, these results should be cautiously interpreted. Another issue related to mastery of the skills becomes apparent at this time. Certain basic sound/symbol skills are likely to be mastered by both good and poor readers and thus may not appear as essential skills using such a classification scheme, even though they are essential to code breaking and even though they can provide a viable tool to help students attain a considerable degree of independence in word recogniti[illegible] (Bond, 1955; Johnson, 1970).

Further data analysis [illegible] might be a viable tool for in[illegible] Since the skills were systema[illegible] next logical step was testing [illegible] to examine what they contribu[illegible] general reading achievement.

Point biserial correlations and significance levels were computed between mastery of the selected Design and Attack skills and the measures used in the study. The classification scheme identified consonant blends, short vowels, consonant digraphs, base words and endings, and long vowel sounds as supportive skills.

Table 15, page 66, indicates that mastery of the individual supportive skills has a stronger relationship to the Kurth synthetic words than the Gates-MacGinitie comprehension test, with the exception of base words and endings. The supportive skills are contributing to the various measures, although some of the correlations are nonsignificant. Most of the variability between the Design skills mastered and the four measures used in the study is left unexplained. Long vowel sounds and consonant digraphs show the strongest correlations of the supportive skills, but they are only of weak to moderate strength.

The vowel + l, a + l, and a + w skill, which could not be classified in the scheme, appears to have a strong relationship to all the measures. Vowel diphthongs, identified as an essential skill in the model of Gray and the present study, appears to have a strong relationship to the measures, also.

Clearly, the correlations within Table 15 indicate that the individual skills are contributing to the various measures used in the study. However, much of the variance is unexplained and no single skill is clearly differentially contributing to general reading achievement.

Hypothesis 2

This hypothesis dealt with the implementation and testing stra-

TABLE 15

[illegible] CORRELATIONS BETWEEN MASTERY ON SELECTED DESIGN WORD ATTACK SKILLS, KURTH SYNTHETIC WORDS, KURTH REAL WORDS, GATES-MacGINITIE VOCABULARY, AND GATES-MacGINITIE COMPREHENSION FOR GRADE 1

Variable	Kurth Synthetic Words	Kurth Real Words	Gates-MacGinitie Vocabulary	Gates-MacGinitie Comprehension
All Design Skills Mastered	.887**	.839**	.838**	.747**
Design Consonant Blends	.351	.275	.213	.190
Design Short Vowels	.389**	.402	.406	.420
Design Consonant Digraphs	.601**	.557*	.549*	.597*
Design Base Words & Endings	.332*	.357*	.358*	.399*
Design Long Vowel Sounds	.594**	.572**	.601**	.453**
Design Vowel + r, a+l, a+w	.751**	.778**	.771**	.651**
Design Diphthongs	.823**	.817**	.806**	.680**

*Correlations are significant at $p < .005$

**Correlations are significant at $p < .0001$

tegies of two elementary schools using the Design word attack element.

8. There is a significant difference between the number of Design word attack tests administered in two school districts.

Results Related to Hypothesis 8: Table 16, page 68, shows the number of Design word attack tests administered for School A, the original school in the study, and for School B, an additional school selected to examine implementation and testing strategies. The results revealed that the mean number of tests administered in School A was 39.969 and the mean number of tests administered for School B was 31.391. A comparison of the means showed there was a significant difference in the number of Design tests administered in School A and School B ($t = 5.889$, $df = 126$, $p < .002$). Therefore, Hypothesis 8 is accepted.

Further data analysis shows that School A and School B are consistent in testing Design word attack Levels A and B. However, at Levels C and D, major differences appear. In grade, 3 for example, at Design Level C, School A administered 486 word attack tests, while School B administered 178 tests. This same pattern appears in grade 3 at Design Level D also. School A administered 120 word attack tests, while School B administered 8 tests. At grade 4, the number of word attack tests administered differs at Design Levels C and D but not to the extent observed in grade 3.

Discussion of Results Related to Hypothesis 8: The data indicate that differences in testing patterns exist between the two selected schools. The difference in implementation and testing strategies,

TABLE 16

NUMBER OF DESIGN WORD ATTACK TESTS ADMINISTERED IN TWO ELEMENTARY SCHOOLS, MEAN NUMBER OF WORD ATTACK TESTS ADMINISTERED, AND STANDARD DEVIATION

School Grade (Number)	Design Word Attack Levels				
	A	B	C	D	Total
School A*					
Grade 3 (32)	203	397	486	120	1206
Grade 4 (32)	210	414	554	174	1352
School B					
Grade 3 (32)	224	395	178	8	805
Grade 4 (32)	217	404	449	134	1204
School A*					
Grades 3 & 4 (64)	413	811	1040	294	2558
				Mean	39.969
				Standard Deviation	6.36
School B					
Grades 3 & 4 (64)	441	799	627	142	2009
				Mean	31.391
				Standard Deviation	9.765

*Original School District

viewed through the number of tests administered, would seem to be consistent with the development of the Design as a prototypic system.

As a prototypic system for a developmental reading program, Otto and Askov (1973) suggest examining and adopting components when feasible, but also encourage adapting, extending, or rejecting components based on local needs and expectations. A great deal of flexibility

is suggested, even encouraged; therefore, modifications are seen in implementation and testing strategies in the two schools examined. The data presented support Berman and McLaughlin's (1976) findings that implementation of an innovation may result in significant modification and mutation of the innovation.

From the data presented, one can speculate that both School A and School B placed a heavy emphasis on word attack skills in the early grades. While School A continued involvement in the area of word attack, School B either deemphasized word attack skill instruction or provided instruction in other areas such as comprehension or study skills. This speculation would agree with the results of a survey conducted by White and Demos (1977). They found that with schools using the Design, the word attack element was focused upon in grades one through three, although at grade three, there was a slight decrease in the number of students using the word attack element. This decrease continued through grade six. At the same time, there was also an increased emphasis on the study skills element and the comprehension element from grades three through six.

This would be a logical explanation developmentally, because if the majority of students had been exposed to and acquired some of the word attack skills by the end of grade two, they would have some independence in translating the printed code and would be prepared to receive focused instruction in comprehension and study skills. Therefore, less specific skill instruction would occur in the area of word attack. At this time, word attack skill development might be integrated into

content areas. The Design word attack tests would then be used to evaluate and monitor student achievement in word attack rather than serving as diagnostic instruments which determine the basis for skill instruction.

The function of the word attack element was also investigated in the study by White and Demos (1977). They found that while the majority of schools used the word attack element as the basis for skill instruction, 25 percent used it to monitor skill development and 35 percent used it in some combined fashion for instructing and monitoring skill development. Thus, a shift in the function of the total word attack element may be a valid inference since the number of word attack tests administered rises again in grade 4. Therefore, at School B, word attack instruction may be dealt with sporadically or integrated into content areas with systematic focused instruction in other areas, with a battery of Design word attack tests administered at the end of the year to evaluate students' progress and monitor development.

Questions 9 and 10

These two questions dealt with differences in the number of attempts to attain mastery.

9. What is the difference in the number of attempts to attain mastery of the selected Design skills?

10. Is the attempt at which subjects master the Design word attack tests reflected in their performance on the Kurth Synthetic Word List?

Results Related to Questions 9 and 10: Table 17, page 71,

TABLE 17

NUMBER OF ATTEMPTS TO ATTAIN MASTERY OF
ALL SELECTED DESIGN SKILLS AND PERCENT OF STUDENTS
ATTAINING MASTERY OF EACH ATTEMPT LEVEL FOR GRADES 3 AND 4

Total Number of Attempts to Attain Mastery of all Selected Design Skills for Grades 3 and 4			Percent of Students Attaining Mastery of All Selected Design Skills at Each Attempt	
	Grade		Grade	
Attempt	3	4	3	4
Pretest	46	46	25.27%	21.80%
1	82	79	45.05	37.44
2	35	50	19.24	23.69
3	11	30	6.04	14.22
4	5	1	2.75	.48
5	2	4	1.10	1.89
6	1	1	.55	.48
Total Attempts	267	345	100	100
Total Attempts (Excluding Pretest)	221	299		

shows the total number of attempts to attain mastery for all of the Design skills investigated and the percent of students attaining mastery at each attempt. For grade 3, 182 students showed mastery of all the Design skills with 25.27 percent mastering on the pretest. The greatest number of students, 45.05 percent, mastered after one attempt. For grade 3, mastery was exhibited by 85.96 percent of the subjects from

the pretest through the second attempt, although one subject was exposed to skill instruction six times. For grade 4, mastery was exhibited by 21.80 percent of the subjects on the pretest. The greatest number of students, 37.44 percent, mastered after one attempt. For grade 4, mastery was exhibited by 82.93 percent of the subjects from the pretest through the second attempt. The percentage rose to 97.15 through attempt three. One grade 4 subject was also involved in skill instruction six times.

Table 18, page 73, shows the mean number of attempts to attain mastery for each Design skill. For grade 3 subjects, the mean number of attempts to attain mastery for all the skills is 1.52 attempts. The range was from 1.09 attempts to master vowel + r, a + l, a + w to 2.44 attempts to master short vowels.

Grade 4 subjects had a mean of 1.64 attempts to attain mastery of all the skills. The range was from 1.01 attempts to master consonant digraphs to 2.2 attempts to master short vowels. Thus, differences were exhibited by both third- and fourth-grade subjects to attain mastery of the specific Design skills.

Table 19, page 74, presents data related to performance on the Kurth synthetic words in relation to the attempt at which subjects mastered each Design skill. Looking at grade 3 for each specific skill and across all the skills, there appears to be no specific pattern related to attempts and performance level on the Kurth synthetic words. For example, at grade 3, the short vowels skill was mastered by three subjects on the pretest and their mean score was 91.67 percent on the

TABLE 18

MEAN NUMBER OF ATTEMPTS TO ATTAIN MASTERY OF SELECTED DESIGN SKILLS BY GRADE LEVEL

Design Skill	Grade	(N)*	Mean Number of Attempts to Attain Mastery (Excluding Pretest)
Consonant Blends	3	31	1.76
	4	32	1.76
Short Vowels	3	28	2.44
	4	31	2.20
Consonant Digraphs	3	27	1.54
	4	31	1.01
Base Words & Ending	3	30	1.40
	4	31	2.00
Long Vowel Sounds	3	24	1.26
	4	32	1.40
Vowel + r, a+l, a+w	3	21	1.09
	4	29	1.56
Diphthongs	3	21	1.18
	4	25	1.53
ALL SKILLS	3	182	1.52
	4	211	1.64

*N=Number of Masters

Kurth synthetic words testing short vowel/a/. After one attempt, nine subjects mastered and their mean score was 88.89 percent; after two attempts, six subjects mastered and their mean score was 75 percent. For the pretest through attempt two, there appeared to be a drop in performance; however, on attempt 3, subjects' performance rose to 87.50

TABLE 19

NUMBER OF MASTERS PER DESIGN SKILL AND MEAN PERCENTAGE SCORE ON KURTH SYNTHETIC WORDS PER SKILL FOR EACH ATTEMPT AND GRADE LEVEL

		CONSONANT BLENDS				SHORT VOWELS				CONSONANT DIGRAPHS				BASE WORDS AND ENDINGS			
		# of Design Skill Masters		Kurth Synthetic Word Mean		# of Design Skill Masters		Kurth Synthetic Word Mean		# of Design Skill Masters		Kurth Synthetic Word Mean		# of Design Skill Masters		Kurth Synthetic Word Mean	
		Grade		Grade		Grade		Grade		Grade		Grade		Grade		Grade	
		3	4	3	4	3	4	3	3	3	4	3	4	3	4	3	4
A	P*	6	6	54.17%	58.33%	3	6	91.67%	79.17%	3	6	75.00%	70.83%	5	7	30.00%	67.86%
T	1	10	11	75.00%	79.55%	9	11	88.89%	84.09%	15	9	63.33%	91.67%	18	8	54.17%	78.13%
T	2	12	12	56.25%	60.42%	6	4	75.00%	93.75%	6	8	75.00%	56.25%	4	8	87.50%	50.00%
E	3	2	2	75.00%	12.50%	4	7	87.50%	85.71%	2	6	50.00%	66.67%	3	8	58.33%	56.25%
M	4	1	-	25.00%	--	3	1	75.00%	100.00%	1	-	75.00%	--	-	-	--	--
P	5	-	1	--	75.00%	2	1	87.50%	25.00%	-	2	--	50.00%	-	-	--	--
T	6	-	-	--	--	1	1	25.00%	75.00%	-	-	--	--	-	-	--	--
Total		31	32	62.10%	64.06%	28	31	82.14%	83.06%	27	31	66.67%	70.97%	30	31	55.00%	62.90%

		LONG VOWEL SOUNDS				VOWEL + R, A + L, A + W				DIPHTHONGS			
		# of Design Skill Masters		Kurth Synthetic Word Mean		# of Design Skill Masters		Kurth Synthetic Word Mean		# of Design Skill Masters		Kurth Synthetic Word Mean	
		Grade		Grade		Grade		Grade		Grade		Grade	
		3	4	3	4	3	4	3	4	3	4	3	4
A	P*	9	7	75.00%	75.00%	.0	6	77.50%	100.00%	10	8	72.50%	50.00%
T	1	11	16	63.64%	76.56%	10	14	92.50%	82.14%	9	10	55.55%	70.00%
T	2	4	8	93.75%	87.50%	1	5	75.00%	90.00%	2	5	37.50%	75.00%
E	3	-	1	--	100.00%	-	4	--	100.00%	-	2	--	75.00%
M	4	-	-	--	--	-	-	--	--	-	-	--	--
P	5	-	-	--	--	-	-	--	--	-	-	--	--
T	6	-	-	--	--	-	-	--	--	-	-	--	--
Total		24	32	72.92%	79.69%	21	29	84.52%	89.66%	21	25	61.90%	65.00%

*P=Pretest

percent, dropped to 75 percent for attempt 4, rose to 87.50 percent on attempt 5, then dropped to 25 percent for the one subject who measured on the sixth attempt. This inconsistency is displayed across all skills.

For grade 4 subjects, looking once again at short vowels, six subjects mastered on the pretest and their mean score was 79.19 percent on the Kurth synthetic words testing short vowel/a/. After one attempt, eleven subjects mastered and their mean score rose to 84.09 percent; after two attempts, four subjects mastered and their performance rose to 93.75 percent. Performance dropped to 85.71 percent for subjects mastering on attempt 3, but rose to 100 percent for attempt 4, dropped to 25 percent for attempt 5, and rose once again to 75 percent on the sixth attempt. This inconsistency is displayed across all skills.

Thus, the data revealed no conclusive evidence examining the relationship between the attempt at which a skill was mastered and performance level on the Kurth Synthetic Word List. However, the data illustrate that a difference exists in both number of attempts and performance and that there is little consistency between the attempt at which Design skills were mastered and subjects' performance decoding synthetic words related to the skill.

Discussion of Results Related to Questions 9 and 10: The results indicate great differences exist in attempts and performance across all skills. The results of the difference in the number of attempts to attain mastery support the findings of Glaser (1968) and Atkinson (1968) who also reported wide individual differences in their investigations

with Individually Prescribed [illegible]
Assisted Instruction. Thus, [illegible]
centage of students eventually [illegible]
mastery faster than others and [illegible]
mastery varies for the differe[illegible]

The range in the numbe[illegible]
several factors. First, the [illegible]
contributing factor. For exa[illegible]
tain mastery of short vowels [illegible]
subjects, whereas the mean nu[illegible]
vowels was 1.26 and 1.4 for [illegible]
that long vowels are easier [illegible]

Secondly, but closely [illegible]
sequence of presentation of [illegible]
concluded that educators migh[illegible]
needed to learn more complex [illegible]
If some skills are easier to [illegible]
ginning with lower level task[illegible]
tained should either be the sa[illegible]
tasks. This may explain the [illegible]
master short vowels and long [illegible]
may center upon the basic iss[illegible]
of skills.

Speculating that the d[illegible]
be related to aptitude, furthe[illegible]

Many factors were brought up in the discussion relative to mastery and performance (difficulty of skills, sequencing of skills, and aptitude) which could not be answered in this study, but which may have influenced the results. The results indicate great differences in attempts required to attain mastery and in the subjects' level of performance relative to the attempt at which mastery was attained.

Summary

[illegible]

[redacted]

[redacted]

[redacted]

Summary

The present study was designed to determine: (1) whether a relationship exists between the number of selected Design word attack skills mastered, general reading achievement, and functional word attack ability; (2) which of the selected Design word attack skills are essential to, supportive of, or non-essential to general reading achievement; (3) what variability exists in the number of attempts (trials) to attain mastery of the selected Design word attack skills and the subsequent effect of performance decoding synthetic words related to the attempt at which mastery was attained; and (4) if implementation and mastery strategies differ between two schools using the Design.

To determine whether a relationship exists between the number of selected Design word attack skills mastered, general reading achievement, and functional word attack ability, sixty-four students, thirty-two at grade 3 and thirty-two at grade 4, were selected from two elementary schools in a suburban community near Wilson, Wisconsin. All

subjects were tested with: (1) the Gates-MacGinitie Reading Tests, vocabulary and comprehension subtests; (2) two individual word lists, one comprised of synthetic words and one comprised of real words; and (3) selected Wisconsin Tests of Reading Skill Development: Word Attack.

Once all the reading measures were administered, the total number of the selected Design word attack skills mastered was computed. That number, which was the independent variable, was utilized to determine the strength and the direction of the relationship to the raw scores on the Gates-MacGinitie vocabulary and comprehension subtests and the Kurth Synthetic and Real Word Lists, which were the dependent variables, for both third and fourth graders. The data obtained were then analyzed using bivariate correlational analysis. As the analysis revealed, there was a significant positive relationship between the number of selected Design word attack skills mastered and general reading achievement, for both vocabulary and comprehension, as well as for functional word attack ability for both synthetic words and real words at grades 3 and 4, although the relationship was not as high at grade 4. The data also revealed the relationship was higher for functional word attack ability than for general reading achievement.

To answer the questions relating to essential, supportive, and non-essential skills, eleven good readers and fifteen poor readers were identified from the sixty-four subjects. Good readers were identified as those subjects whose standard score on the Gates-MacGinitie comprehension subtest fell one or more standard deviation above the national norm. Poor readers were identified as those subjects whose standard

score fell one or more standard deviation below the national norm.

An adaptation of McNeil's (1974) classification scheme was used which defined the skills as follows: (1) essential skills--those skills mastered by 75 percent of good readers and attained by less than 25 percent of poor readers; (2) supportive skills--those skills mastered by nearly all good readers, 90 percent, and attained by 50 percent or more of the poor readers; and (3) non-essential skills--those skills which are not mastered by most, 75 percent, of the good readers. Point biserial correlations were then computed to test the relationship of each skill, identified in the classification scheme, to the four dependent measures.

The classification scheme identified diphthongs as an essential skill; identified no non-essential skills; identified the supportive skills as consonant blends, short vowels, consonant digraphs, base words and endings, and long vowels; and could not classify vowel + r, a + l, and a + w into any category. The point biserial correlations revealed that each skill was contributing more to functional word attack ability than to general reading achievement, except for base words and endings where the reverse was true. However, most of the variance was left unexplained and the strength of the relationship for any single skill was not extremely high.

To answer the questions relating to the differences existing in the number of attempts (trials) to attain mastery and the level of performance decoding synthetic words related to the attempt at which mastery was attained, the Individual Performance Profile was utilized

to determine at which attempt each student attained mastery for each of the selected Design word attack skills. The mean number of attempts to attain mastery was then computed. The mean performance level for each skill on the Kurth Synthetic Word List was then computed and reported for each attempt to attain mastery on the corresponding Design word attack skill.

The data revealed there were great differences in the number of attempts to attain mastery of the selected Design word attack skills, although the majority of the subjects mastered the skills on the pretest or by the third attempt. Comparing the mean performance level on each skill of the Kurth Synthetic Word List with the attempt at which mastery was attained on each of the corresponding Design word attack skills revealed there was little consistency between subjects' performance on the synthetic word list and the attempt at which each Design skill was mastered.

To answer the question relating to implementation and testing strategies, the Individual Performance Profile was once again utilized to determine the exact number of Design word attack tests, Levels A through D, administered to the third- and fourth-grade subjects. An additional school from a different school district (School B) was selected, a random sample of third and fourth graders was selected, and their Individual Performance Profiles were obtained to determine the exact number of tests they had taken. A t-test comparing the mean number of tests administered between the two schools was then computed.

The data revealed there was a significant difference in the mean

number of tests administered in the two schools. Further data analysis revealed consistent patterns through Design word attack Levels A and B, for all subjects, but a sharp decline in total tests administered for grade 3 subjects in School B. It was speculated that the decrease in the number of Design word attack tests administered could be reflecting a change in the function of the word attack element in School B.

Conclusions

The following conclusions seem warranted based upon the results of the study:

1. Students mastering more of the selected Design word attack skills perform significantly higher on measures of general reading achievement than students mastering fewer skills (see page 53).

2. Mastering the selected Design word attack skills relates more closely to vocabulary than to comprehension (see page 53).

3. Students mastering more of the selected Design word attack skills perform significantly higher on measures of functional word attack ability than students mastering fewer skills (see page 58).

4. Mastering the selected Design word attack skills relates more closely to functional word attack ability than to general reading achievement (see page 53).

5. Mastering the selected Design word attack skills relates more closely to general reading achievement and functional word attack ability at grade 3 than at grade 4 (see page 53).

6. The selected Design skills were primarily supportive skills (see page 63) and mastering any skill has no strong relationship to general reading achievement (see page 66).

7. Little consistency is shown between the attempt (trial) subjects master Design word attack skills and their performance decoding synthetic words (see page 74).

8. Design word attack implementation and testing strategies may vary from setting to setting. This may be reflective of its function as a prototypic system which encourages adapting, extending, or rejecting components based on local needs (see page [illegible]

Limitations

These limitations should be considered when evaluating the conclusions:

1. The individual Design word attack tests sampled numerous types of the selected skill (i.e., the Design consonant blends test samples bl, cl, fl, gl, pl, sl, br, cr, dr, fr, pr, and tr blends), but the Kurth Synthetic Word Tests sampled only one sound per skill (i.e., consonant blend /pl/). The selection of other synthetic words containing different blend sounds (i.e., /pr/) could conceivably yield different results.

2. The conclusions are partially limited by the range of skills acquired across the Design word attack Levels A through D. So, even though seven Design word attack skills were examined in depth, the various other Design skills mastered in word attack could have influenced the results.

3. Since the school selected for the study had been using the Design for several years and since mastery of skills is implied in an objective-based approach, there was limited variance in mastery of the

selected Design word attack skills examined. The selection of a school not using a skills management system could conceivably yield different results.

Implications

Implications for teachers and researchers are inherent in the study.

Implications for Teachers

For teachers, the results imply that mastering a subset of word attack skills contributes to children's functional word attack ability. Decoding words which contain the phonic and structural skills examined is enhanced as children cumulatively acquire the skills. However, the cumulative mastery of a selected set of word attack skills does not relate nearly as high to general reading achievement, especially to comprehension as measured by a standardized reading test. Thus, educators cannot assume that because students have mastered word attack skills they will automatically comprehend what they have read.

The classification of skills as essential, supportive, and non-essential related to this study indicates that no single word attack skill explains enough of the variance to functional word attack ability or to comprehension to warrant specific instruction five or six times. Cueing systems other than the phonological are available to children and it seems that instructional time devoted to developing alternative

systems for word identification is justified. Developing and/or improving the students' use of contextual clues, semantic clues, and syntactic clues to assist students' word identification ability should not be neglected. If independence in reading is a primary goal, it seems warranted that we provide students with as many strategies as possible to help them become independent readers.

Implications for Researchers

During the execution of this study, several research problems emerged that seem relevant and feasible to explore. Further examination of word attack skills using more sophisticated statistical procedures to determine the relative contribution of each skill or clusters of skills might provide evidence to help practitioners select skills for their reading curriculum. For example, using multiple regression analysis might be an efficient and powerful technique to help the researcher examine, with relative precision, complex interrelations between independent variables (word attack skills) and a dependent variable (general reading achievement). The knowledge that mastering a particular number of selected skills contributes to a student's reading ability is important; defining more precisely which skill or clusters of skills contribute significantly to students' reading ability is the next step in the research process.

The concept of mastering reading skills needs to be further examined. Several questions quickly surface which warrant further investigation. For example, do students who master a criterion-referenced skill test at 100 percent perform better than students who master the

same test at 80 percent on a terminal task related to application of the skill? How do variables related to time, sequence of skills, aptitude, instruction, or a combination of the four variables affect mastery of reading skills and subsequently student performance on a reading related task? Research to date (Block, 1971; Bormuth, 1974) indicates that an eighty-five percent criterion level is acceptable. However, these studies have not been related to mastering reading skills at the elementary level. Reading researchers are extrapolating from studies done with secondary and college subjects in psychology and mathematics courses. The results from these studies may in fact not be pertinent to the area of reading with elementary school subjects.

The present study illustrated that implementation of a curricular innovation varies between settings. This has implications for researchers conducting methodological studies. The researchers must explicitly state what they are examining and cautiously interpret their results, for they may in essence not be examining or evaluating the same innovation and the results may have very little generalizability. For example, the interpretations and conclusions reached by Chall (1967) and Bond and Dykstra (1967) after reviewing numerous existing methodological studies, generally indicate that great differences exist in any given reading program and/or method used. Related to the present study, this means that putting a label on a method and/or program does not define its operation. Researchers and practitioners then must be extremely cautious in seeking assurance that what is measured in program evaluation does in fact reflect adequate program implementation.

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SAMPLE OF AN INDIVIDUAL PERFORMANCE PROFILE FOR THE
WISCONSIN DESIGN FOR READING SKILL DEVELOPMENT

Individual Performance Profile — Page 1
Unit A R & D Demonstration School — As of 05-27-75

(A) Student Name: Schmidt, Susan

(B) Student No.: 9000

(C) Area: Word Attack

(D) (E) (F) Skill		(G) Attempts	(H) Last Score	(I) Date
A-01	Rhyming Words	3	47	02-01-75
A-02	Rhyming Phrases	1	M	08-01-74
A-03	Shapes	1	M	08-0 -74
A-04	Letters, Numbers	1	M	08-01-74
A-05	Words, Phrases	1	M	08-01-74
A-06	Colors	1	M	08-01-74
A-07	Initial Consonants	2	M	12-01-74
B-01	Sight Vocabulary	0		
B-02	Left-Right Sequence	0		
B-03	Beginning Consonants	2	M	03-11-75
B-04	Ending Consonants	3	M	03-18-75
B-05	Consonant Blends	2	M	03-18-75
B-06	Rhyming Elements	1	55	03-18-75
B-07	Short Vowels	1	27	03-18-75
B-08	Consonant Digraphs	1	M	03-25-75
B-09	Compound Words	1	71	03-18-75
B-10	Contractions	1	53	03-18-75
B-11	Base Words	1	58	03-18-75
B-12	Plurals	1	M	03-18-75
B-13	Possessives	1	50	03-18-75

Level C Not Yet Assessed on any Skill

Level D Not Yet Assessed on any Skill

(Staff of the Computer Applications in Individually Guided Education Project, 1975, p. 6).

EXPLANATION OF THE CONTENT OF AN INDIVIDUAL PERFORMANCE PROFILE FOR THE WISCONSIN DESIGN FOR READING SKILL DEVELOPMENT

Use: To provide achievement information for an individual student at level(s) requested in one area of WDRSD (Word Attack, Study Skills or Comprehension)

Content:

(A) Student name

(B) Student ID

(C) WDRSD element requested (Word Attack, Study Skills or Comprehension)

(D) Level (any combination of levels may be requested)

(E) Skill number

(F) Skill name

(G) Attempts: Number of times the student has received instruction on the skill

(H) Last Score: Result of latest assessment

Numerical score = percent of test items correct (80% or above is considered mastery)

M = mastery
NM = non-mastery (assessed by teacher observation or where numerical scores are not required)
MP = mastery recorded on a pre-test attempt
NP = non-mastery recorded on a pre-test attempt
TC = teacher certification of mastery (used when the 80% mastery criterion has been waived or when the student has been assessed by some means other than the task usually required)
NC = not covered
No information = student has never been assessed on the skill

(I) Date: Date of the latest attempt (i.e., after instruction)

Example: This report lists all skills in each requested level, how many times the post-test for each skill has been attempted, the score received on the latest post-test, and the date of the latest attempt.

Susan Schmidt, student 9000, has been tested three times on skill A1, Rhyming Words, on February 1, 1975. On her latest attempt, she scored 47%.

(Staff of the Computer Applications in Individually Guided Education Project, 1975, p. 7).